Comprehensive clinical assessment of home-based older persons within New Zealand: an epidemiological profile of a national cross-section

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Population ageing is accelerating, driven by falling fertility rates and rapid increases in life expectancy. The number of people aged 65 years or older (65+) worldwide is projected to grow from an estimated 524 million in 2010 to nearly 1.5 billion in 2050.[1] Within New Zealand (NZ), the number of people aged 65+ years nearly doubled between the 1981 and 2013 Census, increasing from 309,795 (9.9%) to 607,032 (14.3%) people.[2] By 2063, people aged 65+ years are predicted to make up 23.8% of the total national population.[2] In addition to the social and economic sequelae, the resultant increase in age-related chronic diseases is challenging all modern health care systems worldwide. NZ is no exception; the current approach to health and disability services provision is considered unsustainable.[3] Policy makers and the health care sector are responding by being continually and actively engaged in refining and implementing fiscally responsible service delivery models within the context of improving quality of care. Garnering apposite valid and reliable

Abstract

Objective: Since 2012, all community care recipients in New Zealand have undergone a standardised needs assessment using the Home Care International Residential Assessment Instrument (interRAI-HC). This study describes the national interRAI-HC population, assesses its data quality and evaluates its ability to be matched.

Methods: The interRAI-HC instrument elicits information on 236 questions over 20 domains; conducted by 1,800+ trained health professionals. Assessments between 1 July 2012 and 30 June 2014 are reported here. Stratified by age, demographic characteristics were compared to 2013 Census estimates and selected health profiles described. Deterministic matching to the Ministry of Health's mortality database was undertaken.

Results: Overall, 51,232 interRAI-HC assessments were conducted, with 47,714 (93.1%) research consent from 47,236 unique individuals; including 2,675 Māori and 1,609 Pacific people. Apart from height and weight, data validity and reliability were high. A 99.8% match to mortality data was achieved.

Conclusions: The interRAI-HC research database is large and ethnically diverse, with high consent rates. Its generally good psychometric properties and ability to be matched enhances its research utility.

Implications: This national database provides a remarkable opportunity for researchers to better understand older persons' health and health care, so as to better sustain older people in their own homes.

Key words: interRAI instrument, community care assessment, epidemiology, national study, older persons health

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empirical data is essential to inform future planning and funding decisions.[4,5]

In 2003, the NZ Guidelines Group noted that large gaps existed between best and actual assessment processes and practices within NZ.[6] Inconsistent and unstandardised assessments were considered to be a significant impediment, with a comprehensive evidence-based and standardised assessment tool being one fundamental way to bridge this gap.[6] A search and evaluation of available instruments was undertaken, which included four comprehensive, six overview, and two screening tools.[7] Although the Home Care International Residential Assessment Instrument (interRAI-HC) rated strongly, a preferred instrument was not explicitly recommended.[7] Nonetheless, in 2004, five District Health Boards (DHBs) – from the 20 that cover NZ – piloted the interRAI-HC.[8] This led to a successful business case for its implementation across all DHBs presented to the NZ Government in 2007.[4] The version developed was for use in community-based populations at risk of admission to aged residential care or requiring long-term supports.[9] After a period of introduction and training, facilitated by a NZ$19 million injection of government funds,[4] all DHBs adopted this interRAI-HC. Thus, since 2012, community care assessments for people needing publically funded long-term community services or aged residential care have all utilised this instrument.[10] Referred by general practitioners, community health workers or hospital-based health professionals, interRAI-HC assessments are conducted by trained health professionals (mainly nurses and social workers). The assessment is used to ascertain a person's level of need, to develop a care plan and to identify appropriate services and support options.[10] Most assessments are conducted at the person's home. Moreover, since June 2015, it has been mandated that each resident in a long-term care facility in NZ will receive a comprehensive interRAI at least twice a year, or when their health status changes, to help provide better care.[11] However, the implementation of this resident care interRAI has not been without challenges.[12]

InterRAI is an international research and clinical network, involving more than 30 countries, with a focus on the development and application of comprehensive assessment instruments to respond to the preferences and needs of persons with complex health demands (see: www.interrai.org).[13] The goal is to promote evidence-based clinical practice and policy decisions through the collection and interpretation of high quality data about the characteristics and outcomes of persons across a variety of health and social services settings.[14] The interRAI instruments are designed to function as an integrated health information system employing a common method to assess complex populations from multiple health and social service sectors.[15] Each interRAI instrument is designed to use person-level information to support care plan development, quality improvement, resource allocation and outcome measurement.

For a person to be eligible for public funding and services in NZ, a needs assessment is required. NZ is the only country where a standardised interRAI-HC has been implemented for the conduct of all community care assessments on older people needing publically funded long-term community services or aged residential care across a nation.[4,10] Individuals are referred by their general practitioner, community health worker or hospital-based health professional for a needs assessment, and booked for an appointment with an interRAI assessor. For residential care, a person must have sufficiently high needs that are definite and ongoing, and must be aged 65+ years (or 50+ years if unmarried without dependent children).[10] The NZ version of the interRAI-HC includes 236 individual questions, assessed over 20 domains, which generate 27 validated instrument scores that guide patient treatment. The adaption of the interRAI-HC for NZ included extensive Māori consultation to ensure that a framework to perform culturally appropriate assessments was established, and so that accurate, systematic and comprehensive ethnicity data were made available.[4] Therefore, the interRAI-HC is a potentially important tool for generating Māori health data. As the primary purpose of using the interRAI-HC is to standardise assessments and treatments of older people, completion of all fields is compulsory. Participants are explicitly asked if they would consent for their de-identified interRAI-HC information to be used for planning and research purposes. InterRAI information is stored electronically and is National Health Index (NHI)-linked, using encryption for data security.[14,16] The NHI is a unique identifier that is assigned to every person who uses health and disability support services in NZ. As such, many different data sources can potentially be brought together, and matched using the NHI.

As of 30 June 2014, about 60,000 standardised assessments of older people had been performed in NZ. It is anticipated that 46,000 home care assessments will be performed annually. While the information gained is used primarily to inform person-level decisions around care, opportunities exist to better understand older persons' health and their health care needs within their own home setting. Internationally, there are numerous activities and population studies using the interRAI,[17-20] but, as yet, relatively little has been published in NZ. Critical to these investigations is an understanding of the interRAI-HC population and the quality of the recorded data. While several international studies have investigated aspects of interRAI-HC data validity and reliability,[9,21-23] its validity has only been examined in a small geographically localised Bay of Plenty study within NZ.[24] Furthermore, while some NZ data have been previously presented,[25] no study in NZ has yet provided a comprehensive national overview. Given the substantial investment by stakeholders and participants, and the research potential of the database, this study aimed to provide a profile of a national interRAI-HC participant cohort with a focus on those aged 65+ years, an assessment of data quality and an evaluation of its ability to be matched to other databases.

Methods

The study involved a cross-section of a continuously recruited national cohort consisting of people who had an interRAI-HC assessment between 1 July 2012 and 30 June 2014 and who consented to their data being used for planning and research purposes.

Primary measures

The assessments used InterRAI-HC 9.1© (interRAI Corporation, Washington, D.C., 1994–2009) modified with permission for NZ use under licence to the Ministry of Health.[26] The interRAI-HC instrument consists of 236 questions used to form 27 scales, including: a Depression Rating scale,[27] the Changes in Health, End-stage disease and Signs and Symptoms (CHESS) scale,[17] and the Activities of Daily Living (ADL) scale.[21] The instrument is partitioned into 20 domains[26] named:

A: Identification Information
B: Intake and Initial History
C: Cognition
D: Communication and Vision
E: Mood and Behaviour

F: Psychosocial Well-being
G: Functional Status
H: Continence
I: Disease Diagnoses
J: Health Conditions
K: Oral and Nutritional Status
L: Skin Condition
M: Medications
N: Treatment and Procedures
O: Responsibility
P: Social Support
Q: Environmental Assessment
R: Discharge Potential and Overall Status
S: Discharge
T: Assessment Information.

Participants may self-identify up to a maximum of three ethnic groups. However, for our purposes, ethnicity was defined using a single priority classification.[28] Māori has priority coding, followed by Pacific, Asian, European and Other. European ethnicity classifications included 'NZ European', 'Other European', and 'European not further defined' identifications.

Procedure

By November 2014, more than 1,800 health professionals had been trained or were in training to be interRAI assessors in NZ. Assessors undertake a two-day training program and competency is reviewed regularly. Quality is monitored at a national level by a competency-based curriculum, standardised training materials and associated e-learning, including a mandatory annual coding examination program.[4] Assessors are able to consult with their supervisors or the National interRAI Training team in Wellington if they have any questions. Assessors use all sources of information and then exercise clinical judgement as to the most appropriate answer based on standardised coding guidelines provided in the instrument's training manual.[9] Most items permit the use of multiple information sources including personal interviews, review of the chart, direct observation of the person, communication with informal caregivers and use of clinical communication between health care staff (e.g. tracking forms, clinical correspondence). However, a number of items are restricted to recording only the person's self-report (e.g. self-rated health; self-rated mood items dealing with depression, anxiety and anhedonia; personal goals of care). Most items also include standardised response sets with item definitions, inclusions/exclusions, and observational time frames provided in the manual and on the assessment form.[9]

A key added strength of the interRAI-HC database is its ability to be matched to other routinely collected databases, such as mortality data through the NHI. For security reasons, information is matched using a two-stage process, where the primary NHI identifier in the interRAI-HC database is also assigned a new encrypted NHI number by the Ministry of Health. Information (such as date of death) is then made available from the Ministry, identifiable via this new encrypted NHI number. The Ministry of Health issued its mortality data in Microsoft Excel format.

Statistical analysis

Reporting of analyses followed the STrengthening the Reporting of OBservational studies in Epidemiology (STROBE) guidelines.[29] Frequencies and percentages were used to characterise the sample overall and by 10-year age band stratifications. Ordinal logistic regression models were employed to investigate differences in the prevalence of health and health behaviour variables over age stratifications, which were treated as a categorical variable to avoid any assumptions of linearity. Asymmetry between patterns of values recorded as zero and non-zero in height and weight variables was tested using McNemar's test. Matching to the mortality database was deterministic, using the encrypted NHI number issued by the Ministry of Health in each dataset. All analyses were undertaken using SAS version 9.3 (SAS Institute Inc., Cary, NC, USA), and α=0.05 defined statistical significance for all tests.

Ethics

Clearance for this study was given by the Ministry of Health's Health and Disability Ethics Committees (14/STH/140) and only includes de-identified data for those consenting to their use for planning and research purposes.

Results

Between 1 July 2012 and 30 June 2014, 51,232 interRAI-HC assessments were recorded. Of these, 47,714 consented records (93.1%) appeared in the original research database. However, 18 duplicate records were found, leaving 47,696 unique observations. Patients were free to choose up to three ethnic identifications. Instead of having three separate fields, the interRAI-HC dataset repeats line entries for the participants – each with their different ethnic identification. This research database contained 399 people with two ethnic identifications and six people with three identifications. Using the priority system,[28] only one record per participant for each assessment was preserved, leaving 47,285 observations. Finally, 49 participants were found to have a repeat interRAI-HC assessment during the study period. Due to this negligible number, and for ease of exposition, only the first assessment was used for the descriptive part of this paper – leaving a research database containing a single assessment for 47,236 people.

Demographic profile of the interRAI-HC cohort

Overall, 29,076 participants (61.6%) were female, 18,158 (38.4%) were male, and 2 (0.0%) had their sex listed as 'unknown'; hereafter set to missing. In terms of ethnic identification, 2,675 (5.7%) reported being Māori, 1,609 (3.4%) Pacific, 1,055 (2.2%) Asian, 41,532 (87.9%) European and 365 (0.8%) as being Other. For national comparisons (Table 1), the last two categories were combined. Age is automatically generated within the electronic interRAI database by subtracting the assessment date from the date of birth. The majority of people in the database, some 45,418 individuals (96.2%), were aged 65+ years; with 74 (0.2%) people <40 years, 16 (0.0%) people <20 years and 1 person aged -1 year. The year of birth appeared to be incorrectly entered for this last individual.

Table 1: Age distribution of the interRAI-HC cohort aged 65+ years (45,418 people) and the New Zealand population aged 65+ years usually resident at the 2013 Census (607,035 people).

	interRAI-HC		New Zealand population	
Age band (years)	n	(%)	n	(%)
65-74	7,421	(16.3)	346,134	(57.0)
75-84	18,351	(40.4)	187,584	(30.9)
85-94	17,959	(39.1)	68,412	(11.3)
95+	1,687	(3.7)	4,902	(0.8)

Table 2: Sex and ethnic distributions of the interRAI-HC cohort aged 65+ years (45,418 people) and the New Zealand population (NZ pop[n]) aged 65+ years usually resident at the 2013 Census (607,035 people) stratified by 10-year age bands.

	65-74 years				75-84 years				85-94 years				95+ years			
	interRAI-HC		NZ pop[n]		interRAI-HC		NZ pop[n]		interRAI-HC		NZ pop[n]		interRAI-HC		NZ pop[n]	
	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)
Sex[a]																
Males	3,256	(43.9)	167,565	(48.4)	7,364	(40.1)	85,128	(45.4)	6,316	(35.2)	25,023	(36.6)	434	(25.7)	1,164	(23.7)
Ethnicity[b]																
Māori	879	(11.8)	22,188	(6.7)	1,033	(5.6)	8,505	(4.7)	338	(1.9)	1,416	(2.2)	21	(1.2)	75	(1.6)
Pacific	489	(6.6)	9,225	(2.8)	670	(3.7)	3,693	(2.1)	269	(1.5)	741	(1.1)	12	(0.7)	27	(0.6)
Asian	232	(3.1)	17,847	(5.4)	501	(2.7)	7,596	(4.2)	260	(1.4)	1,302	(2.0)	12	(0.7)	72	(1.5)
European/Other	5,821	(78.4)	280,596	(85.1)	16,147	(88.0)	159,570	(89.0)	17,092	(95.2)	61,953	(94.7)	1,642	(97.3)	4,521	(96.3)

a: 2 observations missing in the interRAI-HC for people aged 65-74 years;

b: In the 2013 Census, 16,275 people aged 65-74 years had unstated ethnicity; 8,220 people aged 75-84 years had unstated ethnicity; 3,003 people aged 85-94 years had unstated ethnicity; 207 people aged 95+ years had unstated ethnicity.

Table 3: Distribution of selected health and health behaviour variables for the interRAI-HC cohort aged 65+ years (45,418 people) stratified into 10-year age bands.

	65-74 years		75-84 years		85-94 years		95+ years	
	n	(%)	n	(%)	n	(%)	n	(%)
Self-reported health[a]								
Excellent	203	(2.7)	460	(2.5)	585	(3.3)	59	(3.5)
Good	2,391	(32.2)	6,979	(38.0)	7,411	(41.3)	731	(43.3)
Fair	2,696	(36.3)	6,492	(35.4)	6,161	(34.3)	488	(28.9)
Poor	1,287	(17.3)	2,370	(12.9)	1,771	(9.9)	165	(9.8)
Could not (would not) respond	844	(11.4)	2,050	(11.2)	2,028	(11.3)	244	(14.5)
Smokes tobacco daily[b]								
No	6,453	(87.0)	17,332	(94.5)	17,585	(97.9)	1,675	(99.3)
Usually; not in last 3 days	177	(2.4)	195	(1.1)	76	(0.4)	1	(0.1)
Yes	791	(10.7)	823	(4.5)	294	(1.6)	11	(0.7)
Alcohol – highest number of drinks in any 'single sitting' in last 14 days[a]								
None	5,993	(80.8)	14,782	(80.6)	14,668	(81.7)	1,464	(86.8)
1	700	(9.4)	2,178	(11.9)	2,349	(13.1)	180	(10.7)
2-4	543	(7.3)	1,157	(6.3)	822	(4.6)	36	(2.1)
5 or more	185	(2.5)	234	(1.3)	117	(0.7)	7	(0.4)
Cognitive skills for daily decision making[c]								
Independent	3,781	(51.0)	8,538	(46.5)	7,812	(43.5)	688	(40.8)
Modified independence	1,149	(15.5)	3,183	(17.3)	3,499	(19.5)	341	(20.2)
Minimally impaired	1,228	(16.5)	3,108	(16.9)	3,176	(17.7)	303	(18.0)
Moderately impaired	854	(11.5)	2,300	(12.5)	2,271	(12.6)	219	(13.0)
Severely impaired	404	(5.4)	1,200	(6.5)	1,190	(6.6)	131	(7.8)
No discernible consciousness, coma	5	(0.1)	22	(0.1)	10	(0.1)	5	(0.3)
Primary mode of locomotion[c]								
Walking, no assistive device	3,099	(41.8)	6,277	(34.2)	3,797	(21.1)	163	(9.7)
Walking, uses assistive device	3,604	(48.6)	10,776	(58.7)	12,979	(72.3)	1,328	(78.7)
Wheelchair, scooter	478	(6.4)	731	(4.0)	545	(3.0)	79	(4.7)
Bed-bound	240	(3.2)	567	(3.1)	637	(3.5)	117	(6.9)
Falls[a]								
No fall in last 90 days	4,757	(64.1)	11,127	(60.6)	10,102	(56.3)	805	(47.7)
Last fell 31-90 days ago	674	(9.1)	2,016	(11.0)	2,081	(11.6)	212	(12.6)
One fall in last 30 days	1,028	(13.9)	2,989	(16.3)	3,496	(19.5)	409	(24.2)
Two plus falls in last 30 days	962	(13.0)	2,219	(12.1)	2,277	(12.7)	261	(15.5)
Bladder continence[d]								
Continent	4,499	(60.6)	10,490	(57.2)	9,474	(52.8)	722	(42.8)
Continent with catheter	303	(4.1)	852	(4.6)	953	(5.3)	93	(5.5)
Infrequently incontinent	656	(8.8)	1,595	(8.7)	1,718	(9.6)	167	(9.9)
Occasionally incontinent	560	(7.5)	1,645	(9.0)	1,768	(9.8)	196	(11.6)
Frequently incontinent	1,030	(13.9)	2,829	(15.4)	3,087	(17.2)	370	(21.9)
Incontinent	355	(4.8)	930	(5.1)	947	(5.3)	139	(8.2)
No urine output in last 3 days	18	(0.2)	10	(0.1)	10	(0.1)	0	(0.0)

a: 3 observations missing; b: 5 observations missing; c: 1 observation missing; d: 2 observations missing.

Table 2 presents the sex and ethnic distributions of the interRAI-HC cohort and the national population usually resident at the 2013 Census by 10-year age bands for those 65+ years of age. Given the nature and intent of the interRAI-HC, it is unsurprising that this cohort was relatively older than the NZ population. In terms of sex, there was an excess of around 5% in absolute percentages of females assessed with the interRAI-HC in the 65–74 years and 75–84 years age groups, compared to the NZ population. This excess diminished in the 85–94 years age group (to 1.4%), and males were over-represented in the 95+ years of age interRAI-HC group (2.0%) compared to the NZ population. For ethnicity, Māori and Pacific people were over-represented and Asian people under-represented in the interRAI-HC cohort for the 65–74 years and 75–84 years age groups compared to the NZ population. In the 85–94 years and 95+ years age groups, both Māori and Asian people were under-represented.

In terms of living arrangements, 21,492 (47.3%) of interRAI-HC people aged 65+ years lived alone, 13,449 (29.6%) lived with their spouse/partner and no other, 4,629 (10.2%) lived with their child (but not spouse/partner), 3,196 (7.0%) lived with non-relative(s), 2,650 (5.8%) had various other living arrangements, and 2 (0.0%) recorded missing values. In the 2013 NZ Census, nearly two-thirds of people (62.1%) aged 65+ years were living with a partner.[30]

Health and health behaviour profile of the interRAI-HC cohort

Indicator health and health behaviour profiles of the interRAI-HC cohort when stratified by age are given in Table 3. The prevalence of 'good' or 'excellent' self-reported health increased with advancing age stratification, from 34.9% in those aged 65–74 years to

46.8% in those aged 95+ years ($p<0.001$). In contrast, 77% of people aged 65+ years in the NZ Census had good, very good or excellent self-rated health.[30] For non-smoking, the prevalence increased from 87.0% in those aged 65–74 years to 99.3% in those aged 95+ years ($p<0.001$). The NZ Census revealed that 58.7% of people aged 65+ years who answered the smoking status question reported that they never smoked regularly, a further 34.8% were ex-smokers and 6.5% were regular smokers.[30]

Significant age effects (all $p<0.001$) were also seen for all other variables in Table 3, with older interRAI-HC people reporting lower levels of alcohol consumption, increased levels of modified or impaired cognitive function, greater need for assisted or wheeled primary mode of locomotion, higher levels of fall frequencies and less bladder continence than their younger counterparts.

Data integrity – missing values

Missing data were rare. Five or fewer observations were missing for each of the demographic, heath and health behaviour profiles presented. However, not all recorded values were necessarily accurate. Age, for example, ranged from -1 to 109 years, with 16 (0.0%) people aged <20 years. While it is impossible for a participant to be aged '-1' year, disabled children may be cared for by ageing care services and so these values cannot be discounted. Within the interRAI dataset for those aged 65+ years, there were no missing values for height or weight. However, 16,083 (35.4%) people had a height recorded as 0 cm, a further 532 (1.2%) people had height recorded as being between 0 cm and 100 cm, and three had their height recorded as being 240+ cm. Moreover, 13,263 (29.2%) people had a recorded weight of 0 kg, a further 34 (0.1%) between 0 kg and 25 kg, and four (0.0%) people had their weight recorded as being 200+ kg. Overall, 11,323 (24.9%) participants had both height and weight measurements recorded as zero, and 27,395 (60.3%) participants had both height and weight measurements recorded as greater than zero. There was significant asymmetry between zero and non-zero height and weight recordings ($p<0.001$), with 4,760 (10.5%) people having a weight recorded as being above 0 kg but having height recorded as being 0 cm, whereas 1,940 (4.2%) people had weight recorded as 0 kg but height as above 0 cm.

Data reliability – comparing multiple records

Examining records from the 49 interRAI participants who had repeat assessments, the length between their successive assessments ranged from 12 days to 20.1 months, with a median of 5.1 months. In one instance (2.0%) a participant's age was given as 1 year younger at an interview 4.4 months after the first; the sex of that same patient was classified as female at the first assessment and male in the second assessment; and another participant had self-identified ethnicity classified as Māori at the first interview but European at the second interview.

Non-zero height information was available from 22 (44.9%) interRAI participants at both assessments, with a median difference between second and first measurements of -0.5 cm (interquartile range [IQR]: -4 to 2 cm; range: -10 to 11 cm). Absolute differences in assessed height had median 2.5 cm (IQR: 1 to 6 cm; range: 0 to 11 cm). For weight, non-zero information was recorded from 21 (42.9%) participants, with a median difference between second and first measurements of 0 kg (IQR: -1 to 7 kg; range: -12 to 20 kg), and absolute differences having median 5 kg (IQR: 1 to 8 kg; range: 0 to 20 kg).

NHI matching

Overall, 99 (0.2%) participants in the interRAI-HC database were unable to be matched to the Ministry of Health's mortality database. From these, six were easily identified as a formatting error, common to Excel (where one file contained the identifier in exponent form: i.e. '2.54E+7' rather than '25400000' in the other file) and, when corrected, left 93 unmatched participants. From the 47,143 matched interRAI-HC participants, 14,204 (30.1%) had a date of death recorded. The time from interRAI-HC assessment date to recorded date of death was negative for 10 (0.1%) individuals, ranging from -1 day to -20.9 years, with median -4.4 months. Checking the raw data, it appeared that the three most extreme negative times were a result of miscoding contained within the Ministry of Health's mortality file rather than the interRAI-HC database.

Discussion

Considerable clinical and scientific effort has been expended in establishing the interRAI instruments for health care sector use both internationally[4,9,31] and nationally.[4,5,14]

Undoubtedly, NZ's interRAI-HC database is large and rapidly growing. With 93.1% of assessed people consenting for their information to be used in planning and research, analyses will have high statistical power, are likely to suffer from negligible non-sampling biases and are likely to yield generalisable findings. Moreover, the interRAI-HC database captures people of different ethnic identifications in sufficient numbers to make valid epidemiological investigations and comparisons. Within the cohort studied here, 2,675 Māori and 1,609 Pacific people were included. In population health terms, this is among the largest cohort of Māori people with a comprehensive health profile readily available for research.

A notable feature of this interRAI-HC cohort was that Māori and Pacific people were over-represented in the 65–74 years and 75–84 years age groups compared to the NZ population. While ethnic inequities in access to primary health care remain in NZ,[32] and Māori and Pacific people carry a disproportionate burden of disease,[33] this over-representation is important to address in any strategies aimed at this population of people in community based care. However, given that community care assessment is predicated on a deterioration of health status, the differential over-representation of Māori and Pacific people is also a likely reflection of a poorer overall health status. Conversely, Māori were under-represented in the 85–94 years and 95+ years age-bands. Explanations may include reduced access to health assessment or a relatively healthy group of 'older old' Māori, although the latter seems less likely given the patterns observed in the younger age groups. Caution is required in generalising about the health status and needs of older old Māori from these data. When considering the distribution of selected health and health behaviour variables for the interRAI-HC cohort aged 65+ years stratified into 10-year age bands, the significant age effects observed were all consistent with expected age-related declines. This said, of assessed people aged 95+ years, 46.8% had good or excellent self-reported health, 40.8% had independent cognitive skills for daily decision making and 88.4% walked with or without an assistive device as their primary mode of locomotion.

In terms of the interRAI-HC data quality, variable completion rates were very high, with few missing values – a likely consequence of having largely compulsory

questions. Data validity was also high as the interRAI embodies standardised psychometrically validated instruments,[31,34] and predominantly uses variables with defined response categories. However, errors were apparent when the instrument deviated from this structure – as seen with height and weight elicitation and recording. Body size – commonly assessed using the body mass index (BMI), which is composed of height and weight measurements – and weight stability are important individual and population health parameters for ageing people.[11,35] With nearly 30% of the interRAI cohort having a zero weight recorded and nearly 40% having an undefined BMI value, a significant gap in these individual and population profiles exist. Further investigation into the underlying causes of these aberrant data are required, but when physical measurement proves to be logistically impossible or unacceptable to the person being assessed then alternative approaches, such as self-report, may be a useful alternative. These or other strategies to redress difficulties associated with height and weight elicitation require development for these variables to have utility in contributing to our understanding of health outcomes for older people.

Data reliability from the available repeated assessments was generally good, although a 2% error rate in 'fixed' variables (age, sex and ethnicity) was observed. For repeated height and weight measurements that were above zero, some relatively large differences were also noted, although the number of available valid repeat measurements was too small to make a formal statistical assessment. Data matching to mortality records, deterministically done using the NHI, was impressively successful with only 99 (0.2%) participants unmatched and 10 (0.0%) having negative death times. The NHI matching errors primarily result from two sources. Firstly, around half were corrupted by downloading data into Microsoft Excel as they were automatically converted into date formats; and secondly, transcription errors resulted from the mistyping of NHI numbers into the system (some were detected as failing the systems validation algorithm).

As a research database, the interRAI-HC has many salient strengths but also some weaknesses. While it is a large and rapidly growing database using standardised instruments and trained assessors, it is primarily designed as a clinical tool. The multiplicity of assessors, use of multiple information sources and assessors' clinical judgement, and the difficulty in eliciting some fields are likely to affect the psychometric properties of some variables and may introduce an array of reporting and coding biases (e.g. recording null values for variables with compulsory response requirements). Without due diligence, this may lead to erroneous descriptions or relationships. While the community care assessments are standardised and have national implementation and coverage, Māori and Pacific people are much less likely to engage with primary health care than their European/Other counterparts; and many more are entirely invisible to the system until they suffer an acute episode that requires hospital care.[32] Non-participants are likely to have importantly differential health profiles, which will introduce external validity bias in associated epidemiological investigations. Until the extent of the interRAI-HC non-participation rates is known, the magnitude of this bias cannot be quantified. Finally, on a technical note, the growth of interRAI-HC participation is such that transferral and statistical analysis of its associated database will soon outstrip the computer capacity of many researchers using stand-alone machines. However, collaboration with data scientists and involvement of super-computers will negate this issue, and indeed facilitate the development of an even richer evidence base.

Set against these limitations, the interRAI offers many promising opportunities for regional, national and international comparative studies using the same standardised measures.[5,9,18] Moreover, within NZ, through the matching with NHI numbers, an enhanced range of medium-term health outcomes (such as hospital visits, admission and re-admissions, need for residential care, morbidity and mortality) can be investigated. The NHI captures 98% of the population, includes information on every health and disability support service encounter, contains basic demographic information and enables access to some clinical information.[36] This allows researchers to use this unique dataset to help understand the complex interplay of factors associated with a range of conditions.

Conclusions and Implications

The size, coverage, and comprehensive nature of the interRAI-HC in NZ is likely to result in investigations that have potentially large and important population health effects. Reducing the impact of stroke and dementia on older people, for example, is a NZ Government priority area, yet relatively little is known about the factors or drivers of outcomes for such people. Using interRAI-HC and NHI linked data, such knowledge deficits can be redressed. Moreover, interRAI-HC assessments will direct interventions to areas of identified need and allow introduced changes to be monitored and their population level impacts evaluated over time. With interRAI-HC assessments longitudinally repeated, supplemented by NHI linked data, an unparalleled opportunity exists for researchers to gain a better understanding of the needs of older people within their home and as they transition into residential care in NZ. When translated, this will facilitate older people to live better for longer, and also to stay appropriately supported in their homes for longer. Ultimately, this is a desirable outcome for all interested parties – especially older adults.

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